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ABSTRACT

Activities undertaken by 43 states including Maryland to promote technological innovation and economic growth and the impact of these activities are identified. Implications for Maryland are also noted in a brief section of recommendations. State initiatives include: sponsoring research and development at colleges and companies, improving the entire educational system, training workers in the technical skills required by high technology companies; encouraging university/industry linkages so that industrial innovators can draw on academic resources; and providing incentives and economic support for the growth of technology-based firms. A table provides data on funding for state programs designed to promote the development of high technology industry and to foster economic growth. Where available, the total dollars and sources of funds are presented. Two major types of programs involving partnerships between higher education and business/industry are evident: faculty research grants and high technology centers. In Maryland, three such centers exist that may attract investments from business/industry. A partnership grant program for Maryland is recommended that would provide state funds based on competitive grants to faculty to conduct research in specified high technology areas. Matching funds would be provided by business/industry. Appended is a six-page bibliography listing reports, periodicals, and newspaper articles as well as materials received from individual states. (SW)

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State Initiatives to Promote Technological Innovation and Economic Growth

June, 1986

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State Initiatives to Promote Technological Innovation and Economic Growth

State Board for Higher Education
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Annapolis, Maryland 21401

June, 1986

State of Maryland

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FORWARD

During the 1986 Maryland legislative session, the State Board for Higher Education was requested by a legislative committee to investigate the activities undertaken by Maryland and other states to promote technological innovation and economic growth. A draft report was prepared for the committee and was sent to appropriate Maryland representatives and to the executive officers of the higher education agency in each state in an effort to obtain the most accurate and complete information possible.

This report provides information on the activities undertaken by the states and an assessment, where possible, of the impact of these activities. This report includes a funding table that identifies the sources of funding for the various programs.

We are grateful for the cooperation and assistance provided by the segments of higher education in Maryland, the Maryland Department of Economic and Community Development, and the higher education agencies in other states.

Ms. Janice Breslin of the Division of Finance and Facilities had primary responsibility for this report.

Sheldon H. Knorr
Commissioner

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STATE INITIATIVES TO PROMOTE TECHNOLOGICAL INNOVATION AND ECONOMIC GROWTH

I. Introduction

Many states have undertaken a wide variety of activities in order to retain, expand and attract new technology-based research and manufacturing firms in their borders. A report of the National Governors' Association indicated that the spectacular development of high technology industries that occurred in the past in some states resulted from the combination of several factors which include:

> "Close cooperation with academic centers of research and teaching excellence; an ample endowment of highly-skilled, trained labor; the availability of sufficient risk capital, venture capitalists and entrepreneurs; and proximity to federal research facilities, laboratories, and procurement activities."

Most state initiatives in promoting technological innovation, however, are relatively recent and the current competition is intense. The limitations of short-term strategies are generally recognized, therefore, many of the efforts are comprehensive in nature and aimed at medium and long-term goals.

State initiatives in promoting technological innovation include:

1. Sponsoring research and development at universities and companies;

2. Improving the educational system from elementary education to graduate school;

3. Training workers in the technical skills required by high technology companies;

4. Encouraging university/industry linkages so that industrial innovators can draw on academic resources; and

5. Economically supporting and providing incentives for the growth of technology based firms.

This report describes some activities undertaken by states in the areas listed above and attempts to assess, where possible, the impact of these activities. Since this is an area that is constantly changing, the following discussion is not comprehensive but based on data that was readily available to SBHE. In addition, the SBHE sent a draft copy of this report to all state higher education agencies for their review and comments. Fifteen states provided additional information which has been included in this report.

II. State Initiatives

ARIZONA

Arizona has mounted a five-year, $50 million program to establish Arizona State University as an "engineering center of excellence." The project involves both the state and federal governments and industry. Current funding includes a state appropriation of $20 million for the construction of new buildings; industry is purchasing $10 million worth of equipment. The federal government will be funding some of the research ($3 M). Six areas of specialization have been established: solidstate electronics, computers and computer science, computer aided processes, energy systems, thermosciences, and transportation.

Arizona is planning the development of a center in optical circuitry.

ARKANSAS

In 1983, the state legislature established the Arkansas Science and Technology Authority with initial funding of $250,000. The Authority was created to play a major role in the identification, development and application of advanced technologies for increased state economic growth. The Authority can issue bonds to promote development of technologies, own patents and enter into production contracts and agreements, and in general act as a private sector development organization. The Authority is expected to become self-sufficient and reinvest its earnings in expanded development projects.

Arkansas has appropriated $3.4 million since 1983 for institutional development funds to support economic development in the state. Several institutions plan to expand their research activities and virtually all of the institutions plan to establish business-industry centers, where institutional resources and business/industry needs can be matched.

CALIFORNIA

California established the Microelectronics Innovation and Computer Research Opportunities (MICRO) Program in 1981 to support "innovative research in microelectronics technology, its applications in computer information sciences, and its necessary antecedents in other physical science disciplines." The program is designed to help the California electronics and computer industries maintain their leadership by expanding relevant research and graduate student training at the University.

The program has two basic components: support of research projects and research assistants associated with the projects, and the award of fellowships to students in specific fields. Under the research part of the program, faculty members in the University of California campuses submit proposals for research projects that will be at the cutting edge of technology and may

lead to products several years in the future. The projects are jointly funded by the state and industry with each faculty responsible for obtaining a prior commitment from an industrial firm to support at least half the cost of the project. The research is carried out by University faculty members who maintain a close liaison with the industrial donors. Research assistantships are funded as a part of the projects. The MICRO program also involves direct support of graduate students in the form of fellowships in the fields covered by MICRO which include microelectronics and computer sciences and their applications.

In the first year (1981-82), 31 research projects on six campuses were supported with approximately $833,000 of state funds and $1,344,000 of matching industrial contributions of cash and equipment, for a total of $2,177,000. Twenty-five industries sponsored the research. A total of $97,500 were awarded as fellowships. In 1984-85 the state increased the amount of funding to $4 million. Eighty-nine projects are being supported with $3,408,059 of state funds and $8,008,567 of industrial contributions for an approximate total of $11,400,000.

Stanford University set up the prototype research park in 1951 to stop the exodus of engineering graduates to the East. The park, often known as Silicon Valley, contains 80 companies on 660 acres.

COLORADO

The Institute for Computational Studies, a division of the Colorado State University Research Foundation, operates a Control Data Corporation (CDC) Cyber 205 "supercomputer" to assist in conducting research for major petroleum corporations, aerospace companies, other high technology companies, government agencies and other universities across the nation. Because of its high speed and large capacity, the CDC CYBER 205 lends itself to research in the areas of petroleum exploration, weather modification studies, computer software development, silicon chip design, aerospace and aerodynamics studies and robotics. Initial and continuing funding has been provided by grants from several industrial support members.

Colorado has established five regional venture capital funds for a total of $2.25 million to invest in the startup or early stage of new high tech companies. The program requires matching investment.

CONNECTICUT

Connecticut established a quasi-public Connecticut Product Development Corporation (CPDC) twelve years ago that pays up to 60 percent of the costs involved in turning an idea into a production-ready prototype. The state receives a small royalty on the sales of a product it helps develop; companies do not give up equity. CPDC also provides low interest loans to help companies market already developed products. In evaluating a project for funding, CPDC determines first if there is a market.

If the market looks good, CPDC analyzes technical feasibility, often using University of Connecticut faculty as consultants. The CPDC does not fund new business start-ups itself, but works with the Connecticut Innovation Development Program which was established in 1982 to provide venture capital funding.

Connecticut provides state support for research-oriented projects having relevance to the business and industrial sector. In 1985, $3.5 million were allocated to the Fund for Excellence and two capital budget programs entitled, "High Technology Project and Program Grants" and "Cooperative Research Grants." The latter program requires private matching funds.

The New Haven Science Park was established at Yale University in 1981. The park has 82 companies and is located on 80 acres of land.

FLORIDA

Graduate education in high technology fields is supported through the Florida Graduate Scholars Fund, which provides scholarships to full-time students in fields of engineering, information technology, biomedical technology or sciences, material sciences , or "other such areas identified by the Florida High Technology and Industry Council."

Florida has allocated $54 million to upgrade the engineering schools in its state university system.

GEORGIA

Georgia established one of the first state-sponsored "incubator" facilities, The Advanced Technology Development Center (ATDC), located at the state-owned Georgia Institute of Technology. The center provides office and lab space at below market rates and technical and business consultation to the tenants. The center focuses on six technology areas: military electronics and electronics warfare, software and telecommunications, biogenetics, microelectronics, robotics and automated manufacturing, and alternate energy sources. The ATDC has graduated six companies from its center; one has gone chapter 11 while the others are reported to be doing well. One successful alumnus is Digital Transmission Systems which recently received a $7.5 million contract from MCI.

In an effort to make the state more attractive for high technology industry, Georgia has allocated $15 million to the Georgia Institute of Technology to support the Microelectronics Research Center. The Institute's administrators agreed to raise an additional $15 million from non-state sources to expand the center. The decision was based on the results of a study of Georgia's prospects in the high technology business that determined that Georgia's greatest opportunity to excel on a national scale was in the field of microelectronics. Georgia is also funding a $15 million biotechnology center at the University of Georgia in Athens.

In 1982, Georgia's general assembly appropriated $13.8 million to upgrade technical education programs, primarily in the area of electronics, eletromechanical technology and mechanical technology.

The Quick Start program provides specific training to employees of new or expanding industries before plant startup or expansion. This training is free and is custom designed either at the plant or in mobile facilities. The state designs materials, supplies the school facility and pays the instructors. Under Quick Start, Georgia also will recruit, test and screen employees according to company specifications.

HAWAII

The Hawaii High Technology Development Corporation was formed for the purpose of issuing bonds in support of infrastructure development in innovative technology-based firms. It received $100,000 in state funds for first year planning in 1983. The corporation is under the supervision of a nine member board, seven of whose members are appointed by the governor.

IDAHO

The University of Idaho has established a new Engineering Education Consortium with several industrial firms to promote advanced engineering training and education. Under this state/industry jointly funded consortium, engineers from industry will receive advanced education at the university, while university students will have expanded training opportunities in industrial firms.

ILLINOIS

Illinois has put $2 million into a privately managed fund, Illinois Venture Fund, to provide seed capital for high tech start-ups. The state acts as a limited partner; the fund is managed by its general partner, Frontenac Venture Company (Chicago).

The Illinois Institute of Technology Research Institute (IITRI), furnishes research and development services to more than 550 U.S. industrial corporations to help them develop or improve their products. IITRI's services are available to industry on a contract basis. IITRI serves as an effective bridge, especially in manufacturing technology and energy, for the transfer of technologies under development for the federal government to the private sector.

Illinois appropriated $10.5 million in FY 1986 to support instructional, research, and public service programs related to technological innovation and economic growth. These funds continue support for the National Center for Supercomputing Applications at the University of Illinois, promote interdisciplinary research in biotechnology, revitalize engineering research and instruction, and purchase high

technology equipment. The Board of Higher Education has recommended an additional $11.7 million in FY 1987 to expand existing programs and promote new initiatives.

The public universities support a variety of separately organized units closely tied to technological innovation and economic development. These include, the Materials Research Lab, a Biotechnology Center, the Bureau of Economic and Business research, an Energy Resources Center, and a Center for Genetics.

In FY 1986, the state appropriated $2.35 million for Advanced Technology Equipment Grants. Grants are made to individual community colleges to support equipment needs in high technology disciplines. The Board of Higher Education has recommended an additional $250,000 for this program in FY 1987 to bring the total to $2.6 million.

In FY 1986, the state also appropriated $3.5 million in economic development grants. These grants support local community coleges in their efforts to respond to the educational needs of local businesses and strengthen occupational and technical instruction programs. The Board of Higher Education has recommended an additional $500,000 for this program in FY 1987 to bring the total to $4.0 million.

The Board of Higher Education administers an Engineering Equipment Grant program which supports the purchase and upgrading of high technology engineering equipment. In FY 1986 $1.0 million in state tax funds were appropriated. The Board has recommended an increase of $250,000 in FY 1987 in this program. Grants are made to individual public and private universities.

In FY 1986, $26.5 million was appropriated for capital projects directly related to high technology efforts. These funds included $10.0 million in matching funds to establish the Beckman Institute at the University of Illinois at Urbana Champaign. The Beckman Institute is a research and development enterprise in the areas of artificial intelligence and cognitive science. Another $13.7 million is devoted to building a new microelectronic laboratory at Urbana.

The Board of Higher Education has recommended $21.3 million for capital projects in FY 1987 related to high technology efforts. These recommendations include $15.4 million for an addition to a digital computer laboratory at the University of Illinois at Urbana-Champaign.

The Department of Commerce and Community Affairs has developed a program, I-TEC, that provides a link between Illinois' research talent and the business community. Under the program, Technology Commercialization Centers were developed at 12 universities and federal laboratories in partnership with community colleges throughout the state. The goal of the centers is to produce and commercialize new ideas and products and to enhance the transfer of new technologies from laboratories into the marketplace. Each center also provides assistance to develop technology based products and businesses.

INDIANA

In 1981, Indiana established the Corporation for Innovation Development. The corporation was created to stimulate the growth of venture capital for investment in innovative small business enterprises. The corporation can grant up to $5 million in tax credits for private investments in its venture capital fund; Indiana allows a tax credit of 30 percent on individual investments. The Corporation invests its venture funds in three ways: (1) in Small Business Investment Companies (SBICs) which in turn provide equity and loan financing to small business; (2) directly into new start-up technology-based small businesses; and (3) directly into more established industries which, because of their size, may not be eligible for SBIC financing. In addition, a minimum of 5 percent of CID's net income is to be donated to Indiana state universities for R & D efforts aimed at the development of new technology applications.

The Corporation for Science and Technology is a private, nonprofit corporation that invests in high technology seed companies in Indiana. The Corporation, run by a board appointed by the governor, looks for a return from royalties of twice its initial investment. Twenty million is appropriated to the Corporation every two years. Since its startup in 1983, the Corporation has invested a total of $21 million in 37 companies.

Indiana's "Training for Profit" program provides assistance to new or expanding industries for training, retraining and upgrading the skills of potential employees. Eligible industries include those who will be supplying a service or an article of trade or commerce that can be transported and who meet the requirements of the Indiana Department of Commerce. The size of the grant award is determined by the number of long-term jobs that will be created and the companies' commitment to locating or expanding their facilities in Indiana.

The Computer Integrated Design, Manufacturing, and Automation Center (CIDMAC) was established at Indiana's Purdue University in 1982. CIDMAC is a cooperative venture organized by the university and sponsored by Cincinnati Milacron, Control Data Corporation, Cummins Engine Company, Ransburg Corporation, and TRW. Research conducted involves faculty in the schools of electrical, industrial, and mechanical engineering and the Krannert Graduate School of Management. The center receives over $2 million a year from the university, industry sponsors,and other outside sources such as federal grants. CIDMAC's goal is an integration of the research areas of computer-aided design (CAD), computer aided manufacturing (CAM), robotics, automation, group technology, and simulation of product processes and management techniques for production management.

In 1983, the Institute for New Business Ventures was established as a non-profit corporation. The Institute focuses on promoting economic development and new employment in Indiana through the formation and support of small technologically oriented new business enterprises. It serves as a broker linking new business ventures with the technical, management, financial, and educational resource capabilities in the state.

IOWA

In 1983, Iowa created the Iowa High Technology Council. The purpose of the council is to encourage the development of high technology industries and research in Iowa which will establish new employment opportunities for Iowan workers, assist in improving the efficiency, productivity and viability of family farm operations or other existing operations, encourage the development of research capabilities, and improve the quality of life in an environmentally sound manner. The Council was funded at $3 million. Fifty thousand dollars were allocated for operations and $50,000 for the creation of a system to get new research developments into the hands of Iowans who could use them. Two million were targeted to fund projects that will provide help to Iowa's economy within the next few years.

The Iowa Program for Innovation at the Iowa Center for Industrial Research Service (CIRAS) provides a place for inventors to obtain assistance in developing ideas or inventions and an assessment of the invention's marketability. Under the Iowa Innovation Program, inventors requesting technical and management assistance complete a confidential innovation registration and disclosure document, providing information about their idea or invention. CIRAS staff and Iowa State University faculty review these documents at no cost to the inventor to determine marketability of the proposed innovation. After the initial evaluation is completed, the invention may be chosen for more detailed review, for which the inventor is required to pay a $75 fee. This review involves an assessment of technical feasibility, detailed marketing analysis and a preliminary patent search. The inventor is provided with a written evaluation report and, if he or she wishes to proceed, can request of CIRAS specific information on applying for loans, plant layout, and other management and financial information. CIRAS does not assume any ownership or equity in the invention, and the "disclosure document" serves to protect the rights of the inventor during product review phases.

The Iowa Development Commission was given $100,000 from the state to start the Iowa Venture Capital Fund. This private corporation plans to raise $15 million through a state issuance of private securities to the public. Investors can receive a 5 percent state income tax credit on their initial investment.

The Iowa Product Development Corporation was begun in 1983 using $750,000 in state funds. This corporation, governed by an 11-member board selected by the governor and confirmed by the state senate, can issue notes, obtain additional state funding,

and hold patents. The purpose is to help investors get products completed and into the market. It is designed primarily to fund "start-up" ($50,000 - $100,000) ventures. Since its creation, the corporation has invested in seven ventures.

KANSAS

In 1983, the legislature created the Kansas Advanced Technology Commission (KATC) for the purpose of developing, promoting, and coordinating programs to enhance the development of technology-based industry in Kansas. The KATC administers the Research Matching Grant Program and serves in an advisory capacity to the Board of Regents in the development of Centers of Excellence.

The Research Matching Grant Program is designed to stimulate high tech development by utilizing university research expertise to meet industrial needs and potentials. State funds are invested in projects at institutions, with a match of 150 percent from the sponsoring industrial firm. The program places priority on programs and projects that will enhance employment opportunities and stimulate high technology economic development in the areas of agricultural and industrial processes, biochemistry and related biotechnical processes, computers, engineering, natural resources, plastics, and telecommunications. In the 1983 legislative session, $610,000 was appropriated for this program.

The Center of Excellence Program was established in 1984 with first year funding of $130,000. The funds were allocated to three state universities to establish a Center of Excellence in some area of advanced technology. This first year state allocation is contingent on the institutions obtaining $195,000 as a private match. In 1986, each institution's award was increased to $168,000. Each institution may spend $84,000 without matching funds, but a dollar-for-dollar match is required for expenditures beyond $84,000.

KENTUCKY

The Bluegrass State Skills Corporation (BSSC) was created by the 1984 General Assembly to improve and promote employment opportunities in Kentucky by creating and expanding programs of skills training and education which meet the needs of business and industry. The BSSC received an appropriation of $855,200 in general funds for the 1984-86 biennium. (One million dollars have been proposed by the governor for each year of the 1986-88 biennium.) The Skills Training programs have placed 1,437 Kentuckians in jobs and another 2,975 have been upgraded or advanced in their jobs. In addition, $2,218,000 from businesses and industries has been contributed as the private sector matching effort for program participation.

A Robotics Center in the University of Kentucky College of Engineering is being developed to conduct graduate level academic

research of the highest quality and to reach out to industry across the state to transmit knowledge gained through research. The new center will coordinate its programs with those of other institutions of higher learning in the state. A coordinated extension program is planned which will reach across Kentucky to offer many services to business and industry relating to automation and manufacturers' facilities. The Governor has proposed $10 million to build a new facility for the Center and another $3.2 million in operating funds for 1987-88.

Kentucky has been chosen to participate in the Experimental Program to Stimulate Competitive Research (EPSCoR) sponsored by the National Science Foundation (NSF). The Governor provided a $25,000 grant which was matched with a $75,000 grant from NSF. This $100,000 was used to analyze Kentucky's science and technology base and to develop a five-year research improvement proposal to strengthen the state's research capabilities. Up to $3 million in NSF support will be awarded to the successful programs, which must be matched by funds from state sources. The principal source of this matching support is state government, but funds from business and industry and participating universities will supplement this match. Six hundred thousand has been requested of the legislature for each year of the next biennium.

LOUISIANA

The Louisiana Innovation Center was established at Louisiana State University in 1983 with $100,000 in state funds. The center provides evaluation and development expertise to small business entrepreneurs.

In 1984, the Science and Technology Foundation was created. The purpose of the foundation is to further research and development in high technology and bio-technology areas.

The enactment of the Louisiana Small Business Development Law in 1985 created the Louisiana Small Business Development Corporation and the Louisiana Small Business Consortium. In addition, the law established several financial assistance programs to assist in the development and growth of small business, including a loan guaranty program, an incubator loan program, and a development fund.

Since 1980, Louisiana has enacted over 70 measures designed to enhance economic development.

MAINE

Maine has established the Maine Capital Corporation, a privately run SBIC. The Corporation received $1 million in original capital. Investors receive state tax credit. Since its creation in 1980, 11 deals have been made for a total of $750,000.

The University of Maine's Laboratory for Surface Science and Technology (LASST) at Orono operates an industrial affiliates program. Membership in the program provides affiliate industries with priority access to LASST's expertise and analytical facilities. This, in turn, enables the laboratory to increase the number of students receiving technical training and assists LASST in the development of new research facilities.

MARYLAND

The University of Maryland has been appropriated $3.8 million by the State to support the development of the Maryland Biotechnology Institute. This funding will allow the startup of three centers: Marine Biotechnology, Advanced Research in Biotechnology and Medical Biotechnology. The Center for Advanced Research in Biotechnology, based in Montgomery County's Shady Grove Life Sciences Center, is a cooperative venture with the National Bureau of Standards and Montgomery County. The Marine Biotechnology Center will be located in Baltimore and will involve the University of Maryland, Johns Hopkins, and the National Aquarium. The institute's centers will conduct significant research involving faculty from the University of Maryland and other universities and researchers from government agencies and business and industry.

The Engineering Research Center was created at the University of Maryland with state funding of $1.8 million. The center provides a variety of research services to science-based firms in Maryland through four major programs: Technology Extension Service (TES), Technology Advancement Program (TAP), Technology Initiatives Program (TIP), and Research Partnerships. TES, the center's main program, offers technical assistance to Maryland business from four regional offices throughout the state. Over 60 industry projects have been initiated and are now in process or completed.

The University of Maryland has requested an annual budget of $3 million for a Center for Advanced Computer Studies. The purpose of the center is to conduct basic research on alternatives for super computers and their applications. The University of Maryland received initial funding of $700,000 in FY 1986; an additional $1 million has been included in FY 1987. The center is expected to be funded largely by federal, state and industrial grants and contracts.

The University of Maryland has been selected as one of the first six national centers of excellence in engineering research, resulting in a $16 million award by the NSF to create an Engineering Systems Research Center. The Center will involve cooperation with industry and the robotics laboratory of Harvard University.

The University of Maryland Science and Technology Center is a research park which will include the Supercomputing Research Center for the Institute for Defense Analysis. Linked to the University's Institute of Advanced Computer Studies, the Center

will focus on multiprocessing architecture and tasking, VLSIC, system interface, and packaging. Construction of a building to house the Institute is expected to be completed in approximately six months.

Montgomery County has committed $300,000 over three years in seed money to support the newly formed Montgomery County High Technology Council. The council is a private, nonprofit organization whose goal is to promote the development of academic resources needed for the continued growth of local businesses involved in new technologies. The council hopes to foster research collaboration between the private sector and the universities. Montgomery County also will pay for a new building to house the masters degree programs in electrical engineering, computer sciences, and technical management to be offered by Johns Hopkins.

Johns Hopkins has an institutional commitment to foster the technology transfer process. This commitment is carried out in various ways throughout the institution. First, the University has two patent management offices that assist University researchers in identifying, patenting, and licensing inventions. In addition, the major academic units have established offices of industrial liaison which aid faculty and industrial firms in developing mutually beneficial associations.

The Johns Hopkins Hospital and the University have recently chartered a separate corporation dedicated to fostering industrial and business development based on real and intellectual property of the parent corporations. A particular goal is the establishment near the Hopkins institutions of industrial companies devoted to biomedical research and health care which might interact with Hopkins in a mutually beneficial fashion.

Johns Hopkins has a variety of centers and programs which are intended, in part, to bring together industry, government and academia for special purposes. Examples of such centers include the Center for Alternatives to Animal Testing and the Center for Non-Destructive Evaluation. Within the Hopkins research enterprise approximately 175 active research projects are supported by grant and contracts from more than 100 industrial corporations. Hopkins has received $3.5 million this year from the Howard Hughes Institute for Scientific Research.

Currently, Johns Hopkins has agreed to provide several part-time graduate degree programs in Montgomery County in response to expressions of need from the high technology corporate sector.

In 1984 the General Assembly enacted a new program to provide scholarships to individuals seeking certification to teach in an area of critical shortage. The amount of the scholarship is equal to tuition, and room and board for full-time undergraduates at UMCP. Recipients must agree to teach in areas of critical shortage as certified by the Department of Education.

In the first year of the program, 32 awards were given for a total of $68,753.

The four-year institutions making up the Maryland State Universities and Colleges System receive funds from federal agencies and business and industry in the form of grants and contracts for research services. Coppin State College, for example, is the recipient of a grant from the Department of Health and Human Services in the amount of $450,883 (covering a 3 year period) for biomedical research. The project will provide expanded opportunities for faculty and students in biomedical research. Funds received from federal agencies, such as NASA, NEH, NIH and DHHS are earmarked for research and student enrichment projects.

Bowie, Towson and the University of Baltimore provide cooperative education work assignments for students in high tech fields. The System institutions, working with the business and industrial sector, arrange for a variety of experiences for students through internships and cooperative ventures that characterize the work of a given industry. Faculty members are used by the business and industrial communities as consultants in high tech and related fields. They respond to business and industry needs by offering their time as consultants and developing programs to meet employee training needs. At the request of area industries Frostburg State College through the Small Business Institute has conducted nine training programs for industrial personnel during this academic year. The Bowie State College Academy for Computer Training represents the kind of continuing education that is available to the local communities the institutions serve. Salisbury State College has just received approval for a major in physics with emphasis on microelectronics. The high tech industries on the eastern shore are supporting the college in the development of the program. This is an example of the faculty and administration of an institution responding to the need of the adjacent community. An appreciable contribution in technological development is realized as a result of faculty involvement.

Maryland community colleges, through their own initiative, provide a variety of services to business and industry in the state. All of the seventeen colleges offer open enrollment courses for businesses, and fifteen of the colleges provide customized training. Four colleges have offices or centers for business and industry, five have small business resource centers, and three have management institutes to serve the business community.

Most of the initiatives in the community college segment have been developed and implemented with existing state and local funding. However, community colleges recently have been receiving increased outside funding for business and industry efforts. Catonsville and Essex community colleges, for example, have been the recipients of a major Sears Foundation grant to expand partnerships with business and industry. The United States Small Business Administration has contracted for the

operation of small business assistance centers at the following community colleges: Anne Arundel, Catonsville, Howard, and Montgomery. Additional negotiations are underway. Furthermore, the Maryland Department of Economic and Community Development has supported major training programs for new and expanding industry in "high tech" areas. Training has been conducted for Grumman, Superfoss, and Cardinal Industries. These training contracts have been entered with Wor-Wic Tech, Allegany, and Anne Arundel community colleges, respectively.

In 1983, legislation was passed that established a Task Force on Technical Education in Southern Maryland. The purpose of the task force is to bring together educators from public schools as well as colleges and universities serving Southern Maryland along with government and representatives of high tech businesses in the area. The task force is working to get all segments to work together to improve science and technical education in the region.

As a part of this effort, the Southern Maryland Consortium on Technology Education was established. Comprised of the University of Maryland, St. Mary's College, Charles County Community College, and the Capitol Institute of Technology, the consortium works together to help publicize opportunities intechnical education, determine the need for new programs, and generally improve the cooperation between schools, colleges, business and government.

MASSACHUSETTS

In 1979, Massachusetts formed a quasi-public organization called the Massachusetts Technology Development Corporation (MTDC). The MTDC has invested almost $6 million in "seed capital" to aid in launching 27 companies. The MTDC requires matching funds; its investments have pulled in $50 million from private sources. The organization handles investments that involve high risk and low sums of money. The typical MTDC investment is $100,000 - $300,000, a sum much lower than the $1 million deals that private financiers generally prefer.

Massachusetts established a Bay State Skills Center in 1980 with $3 million in state monies to help fund training programs for occupations in high demand by industries in the state. In order to qualify for funding, private businesses located in Massachusetts must contribute at least 50 percent to a training program; the other 50 percent is paid for by the BSSC. The center worked with Massachusetts computer companies to install a robotics and artificial intelligence division at the University of Lowell.

The Massachusetts Technology Park Corporation was set up to establish a state-wide network of facilities dedicated to specific areas of science and technology. These facilities will be used by educational institutions and private industry to train students and employees. The first of these facilities is a proposed $40 million Massachusetts Microelectronics Center. Half

of the funding for this center will come from the state, with the balance to be provided by a future consortium of private companies and public and private institutions of higher education. The governor has also committed state support and surplus state property to the development of a Bio-Technological Research Park adjacent to the University of Massachusetts Medical School in Worcester.

MICHIGAN

In 1983, Michigan established the Michigan Venture Capital Fund. The Fund invests 5 percent of the State's employees' pension fund in later-stage, high-tech investments. Since its creation, the fund has invested $42 million in 25 companies.

Michigan's State Research Fund of $21.7 million awards grants for up to 75 percent of the cost of developing products and processes that will help create jobs and diversify the state's economy. The fund has focused on four technologies: automated manufacturing, genetic engineering, health and medical devices, and food processing. The activities funded by the grants vary in scope as well as field. Some recipients merely establish the feasibility of an idea; others develop and test a prototype of a commercial product. Grant proposals and funding are restricted to universities and colleges submitting applications in cooperation with a business or private entity.

The Industrial Technology Institute was established at the University of Michigan with partial sponsorship from industry to conduct research in robotics and other factory-of-the-future topics. The Institute accelerates university research and encourages the transfer of technology to job-making private concerns. The Institute was supported by $21 million in seed money from the state. Michigan has developed a technology transfer program to help reinvigorate the state's dominant industries: autos, food processing, and forestry products. The state's Commerce Department has compiled a database of research being done at state universities. To access the database, a company calls one of five regional "technology transfer agents," who performs a search to find which faculty members at which campuses are conducting studies in a particular area.

Michigan is providing $6 million in state funds for a new Molecular Biology Institute to be located at Michigan State University in East Lansing.

The Metropolitan Center for High Technology, developed in close association with Wayne State University, focuses on the special needs of small business entrepreneurs. This center is developing incubator facilities and expects to provide engineering, market survey, and other consultant support services to new business ventures. Financed with $1.5 million in state funds, the center also intends to foster development processes from the idea stage to the point where venture capital sources are willing to consider investing for commercial production purposes.

MINNESOTA

Minnesota recently enacted a tax credit that allows a corporation to reduce its tax bill by 30 percent of the value of the technology it transfers to a small business. "Technology" can include ideas and patents in addition to hardware and software. The program is designed to help small high tech companies spin off from large ones.

Minnesota recently started a Job Skills Partnership program that awards grants to all types of educational institutions to develop and provide training programs required by Minnesota companies. Grants are made to public and private vocational schools, community and four-year colleges, and even K-12 school systems. Grants must be matched in cash or in kind by the company or companies that will benefit from the training.

In 1983, Minnesota created an "Alliance for Science," comprised of business, industry, education and labor leaders. This coalition seeks to strengthen science and mathematics teaching at elementary and secondary school levels. The Alliance received funding from the Bush Foundation and has begun a program aimed at increasing enrollment in science and mathematics, ensuring adequate numbers of qualified science and math teachers, improving instructional resources, and gaining public support for improvements in math and science education.

Minnesota's Institute of Technology sponsors three university/industry research centers: the Microelectronics and Information Science Center, the Productivity Center (CAD-CAM and robotics), and the Biotechnology Center. The Microelectronics Center is the most fully developed of the three with funding provided by several large computer/data processing firms, whose researchers participate with those of the university in joint university/industry research teams. In addition, the Institute operates an intensive one-month industry funded seminar for midcareer engineers and also participates in an instructional television network linking 15 large business firms.

MISSOURI

Missouri has established a Missouri Math Teacher Retraining program in order to increase the number of secondary school math teachers. The program was first instituted in the summer of 1982 to retrain 20 recently laid-off public school teachers to become math teachers. The program doubled the number of new math teachers available in the state for the Fall 1982 classes.

Missouri's General Motors Training Program is aimed at encouraging the relocation of new industries to the state. The program is a cooperative effort of the state, GM and the United Auto Workers to train workers in robotics and related technological skill areas for the opening of a new GM assembly plant in Wentzville, Missouri. The state provides technical assistance, teacher training, curriculum development and reimburses GM for 70 percent of the cost of the instructors. In

addition, the state and the area vocational schools have provided instructors in some subjects.

In 1982, the University of Missouri-Rolla began a CAD-CAM robotics center to train engineering students in state-of-the-art manufacturing techniques. Seven Missouri and national firms have contributed funding and equipment and the center receives National Science Foundation funding through a Computer Assistance for Undergraduate Science Education grant.

The state of Missouri currently provides $1 for every $2 from industry up to $950,000 for basic research, and $1 for every $1 from industry, up to $475,000 for applied research projects.

MONTANA

In 1983, Montana passed the Montana Capital Companies Act. The Act supports the formation of new venture capital corporations by providing tax credits to individuals of up to 25 percent of their investment in these new companies. The maximum allowable credit per taxpayer is $25,000 and a ceiling of $375,000 in tax credits is set for each particular company.

The Montana Science and Technology Development Board was established by the state legislature in 1985 and appropriated $2 million for operation for 1985-87. All of these funds, except $300,000 which are for administrative expenses, are for investments in technology development projects that have short or long-term potential to stimulate economic development in Montana. Projects may include: (1) research capability development; (2) applied technological research; (3) technology assistance and transfer; and (4) seed capital awards for development and commercialization of new products and processes.

NEVADA

In the 1985 session, the legislature passed several initiatives to promote technological innovation and economic growth. A quick start initiative was passed that gives the Commission on Economic Development the ability to grant money to a postsecondary educational institution to develop a program for vocational education which is designed to teach skills in a short time to persons needed for employment by new or existing businesses. The state also approved the establishment of a new engineering school at the University of Nevada, Las Vegas and approved funds to further support the existing engineering program at the University of Nevada, Reno. Additionally, specialized funding was approved at both the universities and the community colleges for engineering related courses.

The institutions of the University of Nevada System have sought partnership programs with private technological industries in the area. As a result of these programs, an advanced robotics laboratory and curriculum are located on the campus of Western Nevada Community College and a CAD/CAM center using the most advanced equipment available was established at the University of Nevada, Reno.

NEW HAMPSHIRE

New Hampshire has established the Venture Capital Network (VCN) to match up investors and entrepreneurs. VCN maintains two computer databases, one listing entrepreneurs and their ideas or products, the other listing individuals wishing to invest $50,000-$500,000 in start-ups. VCN continually compares the lists. When a match turns up, it tells the investor, who then has the option of pursuing the investment. The entrepreneur is not told of the match unless the investor expresses interest.

New Hampshire has begun construction at the University of New Hampshire in Nashua for a facility that will house the state's first graduate engineering program.

NEW JERSEY

New Jersey has approved a $90 million bond to upgrade the technical and engineering facilities at public universities and community colleges throughout the state. The largest portion of the funds, $57 million, will support the development of advanced technology centers at New Jersey's research universities. Centers are planned in biotechnology, hazardous waste management, agriculture/food engineering, and industrial ceramics. Most of the centers will involve academe-industry cooperation in which industries pay an annual sum to participate: research projects are designed to reflect the interests of academic and industry participants.

The balance of the bond issue money, some $33 million, will go toward building new labs and classrooms and buying technical equipment to develop science and technology-related programs at the state's public and private universities and 2-year colleges. Ten million will be used to fund the development of Northern and Southern Computer Integrated Manufacturing (CIM) Centers as well as a Technology Center in Burlington County. The remaining $23 million will be apportioned equally among the county colleges, independent institutions of higher education, and four-year public institutions of higher education through a competitive grant process.

In FY 1986, the Board of Higher Education allocated $12 million in supplemental funding to the state's institutions through five separate competitive grant programs. This effort is now entering its fourth year. Two of the grant programs are targeted to improving undergraduate education through the acquisition of computers and other state-of-the-art technology. In FY 1987, the Department of Higher Education has initiated a new competitive grant program that will provide $500,000 for efforts in technological literacy.

In FY 1985, $2 million was appropriated for innovation partnership grants for graduate-level research. Through this

program the New Jersey Commission on Science and Technology has already made five awards totalling $700,000 to scientists at three institutions. An innovation partnership grant is made with the requirement that the academic institution hosting the research obtain matching funds from a New Jersey company.

The FY 1987 budget recommendations for the New Jersey Institute of Technology include $6.2 million for programs to expand upon the excellence initiative that began in FY 1986. This funding is for the establishment of additional "high technology chairs," and the continued upgrading of equipment, library acquisitions, and other support services.

In FY 1986 Rutgers, the State University received an $8.7 million challenge grant. With this funding Rutgers has chosen to recruit world class scholars, to support the work of outstanding junior faculty, to provide additional fellowships and internships for talented graduate students, and to increase library holdings and make physical plant renovations -- efforts that will bring Rutgers closer to its goal of becoming a preeminent research institution.

In 1983, the New Jersey Institute of Technology, with support and financial assistance from the Department of Higher Education and the Office of Management and Budget, established the Center for Information Age Technology (CIAT). With continued appropriations from the Department of Higher Education, the Center provides objective, research-based expertise in information technologies to educational institutions, state and local governments, and small businesses.

The Princeton Forrestal Center, located at Princeton University was established in 1974. The center has 50 tenants on 1750 acres of land. It has become a major center for high technology and is the future home of the National Science Foundation funded supercomputer operated by the Consortium for Scientific Computing, Inc.

NEW MEXICO

The New Mexico Business Development Corporation was started in early 1983 as a privately-owned and operated venture capital fund to encourage the growth and development of high risk ventures. The state legislature authorized the use of $1.8 million in state funds, which with additional funding from private business and financial institutions, will be provided in the form of loans to new high technology small businesses. The Corporation prefers investing in startup or expansion deals in amounts of $100,000 to $400,000.

In 1982, the New Mexico Energy R & D Institute was established. The Institute is appropriated $2 million annually and funds only research and development in the field of energy. Since startup, 16 projects have been funded for a total of $2.7 million.

New Mexico has established five "Centers of Technical Excellence" for the 1984-85 biennium. They are the Center for Non-Invasive Diagnosis ($790,000); Center for High Tech Materials ($1.76 million); Center for Explosive Tech Research ($1.3 million); a Computer Research Lab ($1.35 million); and the Plant Genetic Engineering Lab ($830,000).

NEW YORK

New York has established a New York State Science and Technology Foundation, a public corporation whose purpose is to promote the economic and and social benefits of scientific and technical education and research in the state. The Foundation supports six major programs: (1) Productivity Development Program Awards, (2) R & D Grants Program Awards, (3) Centers for Advanced Technology, (4) SBIR Promotion Awards, (5) Technology Development Organizations, and (6) Corporation for Innovation Development Investments.

The Productivity Development Program was implemented in 1984-85 and designed to assist the state's manufacturing base to become more competitive through the introduction of modern technology. Four projects were supported with $91,000 of Foundation funds which were matched by almost $150,000 of private industry contributions.

The Research and Development Grants Program funds research projects that have commercial potential at academic institutions and not-for-profit laboratories in the state. The $200,000 that was allocated for eight separate grants during 1984-85 was complemented by funding, equipment, and personnel from the companies, laboratories and academic institutions involved. Several of the projects have resulted in commercial application.

Centers for Advanced Technology have been established at seven university campuses. Each center focuses on the university's existing academic strengths. The sites for the centers were selected by the New York State Science and Technology Foundation based on academic excellence and the institution's willingness to cooperate with industry. The centers received $7.5 million in Foundation funding in 1984-85 with the private sector providing more than $9 million.

The Small Business Innovation Research (SBIR) Promotion Program, initiated in 1984-85, provides matching contracts of up to $50,000 to New York State winners of federal SBIR contracts. The awards support applied research and new product development in small technology-based companies. In 1984-85, ten awards were made totalling over $400,000.

The Technology Development Organization Program was established in 1981 to support a grass-roots network for technology development across the state. Three new regional councils were established in 1984-85 and supported by $25,000 in Foundation grants, matched by the private sector. Five existing councils were supported for continued activities.

The Corporation for Innovation Development Program, started in 1982, invests in young advanced technology companies in need of startup capital. The Foundation invested $645,000 in start-up capital in six new technology-based businesses in 1984-85. These funds leveraged over $3 million for these new start-ups from private sector and other public financing resources, for a ratio of $4.76 for every CID program dollar invested. This program has helped to create or sustain over 200 jobs for New Yorkers since its inception.

The New York State Business Venture Partnership allows investment of state pension funds. The Common Retirement Fund and the Teachers Retirement Fund are limited partners. Sixty million has been committed to the venture.

In 1984, New York established a program of 400 "Empire State Mathematics and Science Teacher Fellowships" as part of a strategy to deal with a shortage of certified teachers of mathematics and sciences in the public schools. The fellowships are awarded on the basis of a statewide competition for study in appropriate registered programs at New York degree-granting institutions. Fellowships are $4,000 for one year of full-time study or $1,000 a year for a maximum of two years of part-time graduate study.

NORTH CAROLINA

In 1963, the legislature established the North Carolina Board of Science and Technology. In subsequent years, the board was downgraded to committee status within a department, however, the General Assembly restored the Board designation in 1979. The Board is responsible for stimulating more effective use of scientific, engineering, and technological resources in the state. The Board has played a catalytic role in the policies and programs established in North Carolina to encourage high technology development.

North Carolina established a Microelectronics Center of North Carolina (MCNC)in July 1980. MCNC serves as a neutral education and research center integrating the resources of seven North Carolina organizations - five major universities in North Carolina, the Research Triangle and the MCNC Central Laboratory. The Central Laboratory is an advanced state-of-the-art research and technology development facility that complements the educational and research programs at the participating North Carolina organizations and provides advanced capabilities not available on individual campuses. In turn, the Laboratory depends upon the university and industry communities for a significant portion of the total expertise for collaborative research programs.

Industry can gain involvement through an industrial affiliates program that costs $750,000 for an initial three year membership. Other mechanisms for industrial involvement include Associates, Sponsors, and International Liaison Services Programs.

In its first five years of operation, MCNC received grants of nearly $82 million from the state of North Carolina for construction, equipment, and operations. An additional $50 million has been invested in buildings, equipment, and professorships on the campuses to support related high technology education and research. The state investment is being leveraged with industrial contributions; currently over 30 companies provide support to the MCNC program. The North Carolina Biotechnology Center was established in 1981 to catalog and develop biotechnology resources in the state. The center works to develop or enhance productive interactions between researchers, universities, research institutions, funding agencies, state and federal governments, venture capital, and new or established businesses of varying size. State appropriations include $1.2 million for building improvements and $1.5 million operating budgets for each of FY 1985-86 and FY 1986-87, plus a non-reverting reserve appropriation of $5 million. Although located in the Research Triangle Park, the center itself is not a site for research, but instead provides information, encouragement, and assistance.

North Carolina established a School of Science and Mathematics. The school is a residential school for eleventh and twelfth graders that gives talented students intense instruction in the math and science fields. The school admits students - after passing an entrance exam - from anywhere in the state. The school was recently reestablished as an Affiliated School of The University of North Carolina. In FY 1986 the school had a budget of about $4.6 million.

In 1983, the North Carolina General Assembly created the North Carolina Technical Development Authority. As of June 30, 1985 the Authority established two programs - the Incubator Facilities Program and the Innovation Research Fund. Four incubator facilities were funded with a total of $800,000 in state funds. Over $700,000 in matching funds were received in the form of cash, real estate and other contributions from local governments and businesses. The Authority awarded a total of $600,000 in FY 1984 and 1985 through the Innovation Research Fund to 15 small businesses that offer significant promise for both job creation and return on investment. The Fund has been designed to serve as financier of last resort. The Fund will take an equity position in contracting businesses through the purchase of stock, the receipt of royalities, or other equity instruments. All equity returns are to be funneled back into the Fund for further reinvestment.

The general assembly appropriated $8.5 million for the construction of a computer science building at UNC Chapel Hill, and $710,000 for program development in computer science.

The Mathematics and Science Education Network in North Carolina includes eight centers to serve the educational needs of middle school and high school mathematics and science teachers in the state. Each center is a partnership between a constituent institution and one or more public school systems in its region.

Resources for the operation come from state funds, regular instructional resources of each participating institution, and other public and/or private funds for teacher scholarship aid and scientific instructional equipment. The goals of the centers are to improve the qualifications of present math and science teachers, and increase the number of qualified math and science teachers in high schools in the state.

The scientific equipment needs of university science and engineering laboratories have been given high-priority attention in North Carolina. Nearly $1.6 million has been allocated to four institutions for equipment in engineering and the sciences.

The Research Triangle Park (RTP) in North Carolina today is the largest planned research park in the United States, comprising 5,500 acres and containing more than 35 separate research facilities, located roughly equidistant from three major universities - North Carolina State University, Duke University, and the University of North Carolina. The park's companies, centers, institutes and laboratories employ 17,500 people, occupying facilities valued at $500 million and representing a 1981 combined payroll of $375 million.

The development of the park began in 1956 under the aegis of the Research Triangle Foundation. In 1959, the Research Triangle Institute was formed and became one of the park's earliest occupants with a $500,000 grant and a 137-acre campus provided by the foundation. The institute, with its close contacts with the three area universities, focuses upon contract research; its research volume has grown from $220,000 in 1959 to $47 million in 1980. The park grew slowly during the early 1960's, and by 1965 there were only nine laboratories comprising fewer than 1,000 people. A major turning point was IBM's purchase of a 400-acre site, followed by the decision of the National Institute of Environmental Health to accept the park's donation of a 509-acre facility site. The U.S. Environmental Protection Agency has also now located a major research facility at RTP. Northrop Services recently located a facility in the park to provide environmental support services to these federal research labs. The most recent addition to the park is the General Electric Microelectronics Center. In addition, the state legislature recently approved a proposal to establish a new Microelectronics Center in the park which, it is hoped, will attract additional firms to the park.

NORTH DAKOTA

A recent bill has been passed that authorizes incentives for venture capital companies. The bill provides a 25 percent tax credit for investors.

OHIO

Ohio has established the Thomas Edison Program whose purpose is to stimulate working partnerships between business and academia. Thus far, the legislature has committed $67.9 million

to support the program. The program consists of three main components: the Edison Seed Development Fund, the Edison Technology Centers, and the Edison Incubators.

The Edison Seed Development Fund matches state funds with those put up by the private sector to demonstrate the feasibility of new ideas for products, processes or systems. Support from business participants must be at least equal to the funds requested from the state. Participating businesses must operate in Ohio or agree to locate a research and development or manufacturing facility in the state.

The Edison Technology Centers are located at universities and bring together corporate sponsors and university researchers to explore key areas of technological concern in manufacturing, agriculture and information processing. Substantial contribution is required from the private sector. Each center is assigned specific topical areas that reflect the strength of the university and of the neighboring business community. Edison Incubators provide basic business services such as accounting, legal advice, and secretarial help to support entreprenuers in developing new technology-based companies. Individual incubators are managed by academic/business partnerships.

In its 1983-85 state budget, Ohio supported nine eminent scholars under its new Eminent Scholars Program. These scholars serve to attract and retain outstanding faculty and students, bring new research grants and capability to Ohio's campuses and act as resource consultants for the state. State funds, matched dollar-for-dollar by institutional funds from private sources, create endowments of $1 million each to fund distinguished professorships. The nine scholars funded in 1983-85 bring to Ohio new expertise in advanced manufacturing systems, solid state microelectronics, experimental physical chemistry, molecular genetics, scientific computation, art and design technology, surface science, molecular and cellular biology, and polymer science. The 1985-87 budget provides funding for nine additional eminent scholars.

In order to stimulate new and expanded research efforts at its colleges and universities, Ohio has established a Research Challenge Program. The program offers a partial state match of funding secured from external sources for basic research. The institutions invest these dollars in research projects of their own choosing. It is hoped that increased research efforts will enhance the economic redevelopment of the state. The 1985-87 budget for the Research Challenge Program is $28 million.

In 1981, Ohio began investing state pension funds in new ventures. The Public Employees Retirement System (PERS) can invest up to 5 percent of its portfolio. The PERS has put $10 million into passive investments in two funds and $50 million into 5 direct investments, including one $40 million leveraged buyout. Direct investments are limited to companies that have offices in the state.

The Ohio Development Financing Commission administers a grant program to furnish capital to small and medium-sized innovating firms whose projects will benefit Ohio by creating jobs and promoting the development of new technologies.

OREGON

Oregon has used the more traditional approach of self promotion to develop a high tech economy. Oregon has aggressively courted high tech companies promoting its cheap land and housing, natural beauty, clean water, and overall "livability." Oregon is now home to major facilities such as Intel, Hewlett-Packard, National Semiconductor, and Spectra-Physics along with Tekronix, a native company and the state's largest private employer. Once established in the state, these companies spin off new ventures at a steady rate. In the Portland area alone, some 300 companies sought first-round financing during the last two years.

Oregon also has focused its recruitment campaign on Japan by making a major change in its method of taxing foreign companies. Under the old system a company paid the state a percentage of its total worldwide income;under the new system a firm only needs to declare income earned in the U.S. This change has encouraged Japanese companies to locate in Oregon: Nippon Electric Co., Fujitsu, Seiko, and Kyocera all plan to build plants in the state over the next three years.

The Oregon Graduate Center, a privately funded enterprise, fosters cooperation between universities and high tech industry and provides office and lab space for technology-based companies.

The Oregon legislature appropriated $4.5 million in lottery funds for high tech equipment and research at centers of excellence at three universities in 1985-87. The centers are all related to economic development.

A new High Technology Industry and Education Consortium was recently approved by the Oregon legislature. One and a half million in matching funds were appropriated to the Consortium to coordinate the state's technical and vocational education offerings with the needs of Oregon industry for technically skilled workers.

The Cascade Small Business Development Center is the result of close collaboration between the Portland Community College, Portland Development Commission and the City of Portland's Private Industry Council. This consortium seeks to revitalize the local economy, while creating jobs for area and metropolitan residents. The incubator project calls for the construction of a new 60,000 square-foot office/ business/education complex located on the Portland Community College Cascade Campus at North Killingsworth. This complex will offer below-market rents for office and/or industrial usage and will provide a variety of professional and educational support services to new businesses. Flexible space will enable a diverse number of new businesses to

come in, operate, grow, and move on, creating new jobs and assisting in the economic stability of the north/northeast Portland area.

PENNSYLVANIA

In 1982, the governor of Pennsylvania issued a report, Advanced Technology Policies for the Commonwealth of Pennsylvania, which established comprehensive state policies for advanced technology. In carrying out these policies, the Ben Franklin Partnership was created as well as a number of other programs designed to promote technology and business growth.

The Ben Franklin Partnership links private and educational resources, particularly research capabilities, to make traditional industry more competetive in the international marketplace and to spin off new, small businesses on the leading edge of technological innovation. It also provides resources to address education and training needs, and provide entrepreneurial development services including the provision of small business incubator facilities. The Ben Franklin Partnership includes six programs.

The largest program is the Ben Franklin Partnership Challenge Grant Program which was established in 1983. This program is operated through four Advanced Technology Centers and operates under a "challenge grant" system: each center must raise a dollar from industry before the state puts in the taxpayer dollar. The partnership revolves around universities designated as technology centers; each center is assigned to a geographical region in the state. Each center provides: (1) joint applied research and development efforts, in concert with the private sector, in specified areas; (2) education and training in technical and other skill areas essential in assisting firm expansion and start-ups; and (3) entrepreneurial assistance services. In the first six months the $1 million in initial state funds was matched with over $3 million in funds from the private sector and other sources. In the fourth year of the program a total of $21.3 million in state funds was matched by $80.9 million, including $53.8 million from the private sector. The program expects that its maximum impact will occur over a 4 to 10 year period, although a November 1985 report by the Board indicated the following accomplishments after 30 months:

Number of start-up firms	208
Number of jobs created	1,082
Number of firms expanding	136
Number of jobs created by expansion	970
Number of firms retaining jobs	142
Number of jobs retained	1,518.5

The Small Business Incubator Loan Program, a second program offered under the Ben Franklin Partnership, funds the development of small business incubator facilities that provide new manufacturing or product development companies with the space and

business development services they need to start up and survive in the early years of business growth. A $17 million loan program was established under the Pennsylvania Economic Revitalization Fund in April 1984. A December 1985 publication reported that 20 incubator facilities had been set up, occupied by 81 firms. Another Ben Franklin program is the Seed Venture Capital Fund which provides equity financing to new businesses during their earliest stages of growth, including eligible firms located in small business incubators. A total of $12 million has been made available statewide which includes a $3 million state appropriation matched with at least $9 million in private funds. The program is aimed at filling a gap in capital markets currently not addressed by the private sector venture capital market.

Research "Seed" Grants is a fourth Ben Franklin program. More than $550,000 has been provided to small businesses seeking to development or introduce advanced technology into the marketplace. In 1985-86, $650,000 is available for grants. While grants are made directly to qualified businesses, firms are strongly encouraged to coordinate their work with the four Ben Franklin Partnership Advanced Technology Centers.

The Ben Franklin Partnership administers the Economic Revitalization Tax Credit Program in cooperation with the Department of Revenue. This $25 million program for 1986-88 permits corporations involved in any manufacturing, processing, and research and development activities to convert net operating losses that expired in 1981 and 1982 into 20 percent tax credits for new Pennsylvania plant and equipment investments.

The sixth program in the Ben Franklin Partnership is the Engineering School Equipment Grants. The program provides $3 million in state funds and requires a 3-to-1 match of private sector funds for a total of $12 million. The grants are for the purchase of equipment to be used primarily in the teaching of graduate and undergraduate engineering students. The funds are allocated according to a legislatively mandated formula. Each of the 15 colleges and universities in the state that offer engineering programs must obtain private contributions to receive state funds.

Another program established by Pennsylvania to carry out its comprehensive policies is the Pennsylvania Research Inventory Project (PRIP). PRIP provides an inventory of research capabilities in the state in both the private sector and higher educational institutions. The inventory may be accessed either through a catalogue published by the Department of Commerce or through an on-line computer based information system.

The Pennsylvania Technical Assistance Program (PENNTAP) promotes technology transfer and assists firms in solving technological problems. PENNTAP gathers information and then tailors it to a particular problem so that a business or other institution can make a decision. In 1985-86, PENNTAP received $200,000 in state funds.

In July 1984, legislation was passed permitting the use of up to one percent of the assets from the State Employees Retirement Fund and the Public School Employees Retirement Fund for venture capital and other economic development activities. As of September 30, 1985, a total of $51 million have been invested in six venture capital firms based in Pensylvania. The Polymer Affiliates Program at Drexel University in Philadelphia is a partnership of academia and industry which seeks to attract and train talented people for the polymer industry, encourage industry input for the university's education and research programs, and develop new technology. It also provides technical resources for unusual problems of the industry. The polymer program is an inter-disciplinary education and research program for the advancement of polymer knowledge and technology.

The Pennsylvania Industrial Development Authority (PIDA) targets 25 percent of funds to provide low interest loans to advanced technology industries. The PIDA is used in conjunction with the Pennsylvania Capital Loan Fund (a revolving loan fund operated through local economic development districts and the state), the SBA 503 program, and other funding vehicles. PIDA encourages the loaning of funds to be used in conjunction with the Ben Franklin Partnership program. In 1985-86, the PIDA had targeted $12.5 million for advanced technology industries.

In 1985-86, Pennsylvania provided $100,000 to fund 17 Small Business Development Centers. Through the Ben Franklin Partnership, the Advanced Technology Centers provided an additional $508,000 in state funds during 1984-85 to increase available services to small advanced technology companies.

Pennsylvania has established a number of other programs and policies to encourage the development of advanced technology industries and promote economic growth.

RHODE ISLAND

Rhode Island has set aside funds to underwrite a project called "Rhode Island Partnership." The funds available under this program help make expert advice available from a consortium between the University of Rhode Island and Brown University and provide venture capital for companies developing products in high-technology areas.

SOUTH CAROLINA

South Carolina has embarked on a 61-point improvement plan for its public school system. Funds for the plan will come from a 1 percent increase in the state sales tax. South Carolina feels that improvements in its educational system is the first step toward making the state more attractive to business and industry.

South Carolina offers job training programs to any firm that promises to create at least 20 jobs in the state. The state hires instructors, buys newspaper ads to recruit trainees,

screens applicants, provides training facilities and directs the successful graduates on to the company. Companies are not required to hire the state-trained workers, but it is reported that the program has a 90 percent placement rate.

The South Carolina Research Authority was established in 1983. It is a quasi-public body authorized by statute to promote the development of high technology industries in the state and to enhance the research capabilities of the state's public and private higher education system. Operating with a base of both public and private financing, the Authority is, among other things, developing three related research and development parks located near each of the three public senior universities.

The state provides incentive funding for its public institutions of higher education in the form of a 25% match on non-state funds secured from research and development grants or contracts. This plan provides a total of more than $10 million annually to the public institutions, the bulk of which is claimed by three universities: Clemson University, the University of South Carolina at Columbia, and the Medical University of South Carolina.

TENNESSEE

The Tennessee Technology Corridor Foundation was created as a result of a task force investigation into regional development and technical education in the state's Knoxville Oak Ridge region. An eight mile corridor is planned for the development of high technology businesses and allied industries, that will extend from the National Laboratory in Oak Ridge to the University of Tennessee campus and the Tennessee Valley Authority Headquarters in Knoxville. The Foundation received $1.3 million in state and federal funds to oversee the development of the corridor and provide technical and business assistance to "homegrown", startup-type, high technology-oriented business efforts.

One percent of total state expenditures for higher education go to support the research function in Tennessee. Institutions receive allocations based on historical expenditures and their ability to attract sponsored research. State appropriations totalling over $19 million have been recommended for five special units of applied research centers, including an Agriculture Extension Service, a County Technical Assistance Service, a Municipal Technical Advisory Service, and an Institute for Public Service.

TEXAS

Texas has matched private donations to create $1 million endowments for each of 32 chairs at the University of Texas (Austin) in chemistry, physics, mathematics, molecular biology, computer engineering, materials engineering, microelectronics, and computer assisted design and manufacturing.

The Coordinating Board for the Texas College and University System has adopted the Texas Advanced Technology Research Program. The program awards funds for grants on a competitive basis for research projects at state universities. The legislature appropriated $35 million for the program for a two year period. The funds were awarded in Fall 1985. Projects are selected on the basis of their potential contribution to the development of knowledge and instruction in advanced and emerging technologies in microelectronics, telecommunications, biotechnology, energy, aerospace, materials, and other areas of science and technology. For each proposal, the procedures call for considering a university's record in the field; its capacity to collaborate with business, industry and government on the project and attract funding to it; and whether research in the field already is significant to the institution's mission. The procedures allow proposals involving collaboration between institutions.

In the Spring of 1983, the Microelectronics and Computer Technology Corporation (MCC) was established. The MCC is comprised of a consortium of researchers from high technology companies located in Austin near the University of Texas at Austin and Texas A & M University. The University of Texas at Austin set up a $15 million endowment for faculty positions to support the consortium.

In 1985 the state legislature created the Geo-Technology Research Institute. Located at the HARC, the institute will conduct research in the areas of geophysics, geo-technology, and related fields. The institute is a research consortium made up of the University of Texas, Texas A & M University, Rice University and the University of Houston. The legislature did not appropriate any specific funds for the institute. The Houston Area Research Center (HARC) is the first research partnership involving major universities in Texas. Patterned after California's SRI and North Carolina's RTI, HARC will provide grant and contract research for private industry, government, and other institutions. It is part of an ambitious project called The Woodlands under development by the Mitchell Energy Company near Houston. This is a wholly integrated 25,000-acre residential, research and light manufacturing community. In addition to the 100 acres that HARC will occupy, 400 acres have been set aside for the possible establishment of a University of Houston campus and 150 acres will be made available for high technology businesses and their suppliers.

The Institute for Ventures in New Technology (INVENT) was established at the Texas Engineering Experiment Station in 1983. The purpose of INVENT is to provide technical assistance in the evaluation and development of new products and processes for small business enterprises and individual entrepreneurs. INVENT was appropriated $475,000 in 1986 and 1987.

A similar program was created in 1985 at the University of Texas at Austin - The Center for Technology Development and Transfer.

UTAH

Utah has authorized the creation of the Utah Technology Finance Corporation. The state is investing $1 million to create a $5 million fund by a 4:1 match. The program awards research contracts on a matching basis to small high technology firms. In return, the corporation retains some rights to the research results. It may share in the new firm's equity in the form of royalty or licensing fees.

The Utah legislature appropriated $2.5 million through the Utah Science Council to create centers of excellence. Thus far, most proposals for funding have been related to engineering activities.

Utah has established the University of Utah Research Park to attract and promote industrial technology, to foster economic growth and development by providing an environment conducive to the interaction of the university and industrial communities, and to encourage the transfer of University research and technology to the private sector for the creation of jobs and state revenues. Forty-four firms and 11 university departments are housed in Research Park facilities. Nearly 90 percent of the companies report using faculty as consultants. Over 60 percent have contributed financially to the university. Fifty percent report that they have participated in joint research proposals, and 60 percent use faculty or students in research activities. Many companies have also allowed University departments to use special research equipment and several encourage continuing education by offering to pay all schooling costs of employees who take classes. About 20 percent of the Park employees are University of Utah graduates.

VIRGINIA

In July 1983 the Governor's Task Force on Science and Technology in Virginia submitted a report and recommendations that led to the establishment of a Center for Innovative Technology (CIT) which serves as a technology "broker" between the state's universities and industry, matching companies technological needs with faculty performing relevant research at the institutions of higher education. The CIT also supports joint industry-university research and development at four centers located at the state's principal research institutions -- the University of Virginia, Virginia Commonwealth University and Virginia Polytechnic Institute and State University. The center received $30 million in state funds for 1984-86 to begin its activities and to support research carried out by the universities with or on behalf of industry. The CIT also conducts information transfer programs and is developing a state-wide faculty data base to match industry consulting and research needs with faculty expertise. The center will receive $18 million in state funds for 1986-88.

The Governor's Task Force recommendations also led to the initiation of a Cooperative Graduate Televised Engineering

Program operated by five public universities to provide master's level engineering education to regions of the state lacking engineering schools. The state appropriated $7.8 million for 1984-86 and $8.6 milion for 1986-88 to this program. The cooperative program began in response to the need for part-time continuing education for business and industry employees who wanted to continue their full-time work while upgrading or refreshing their skills. The program supports existing business and industry and enables the state to recruit new firms to the region by guaranteeing educational services to their employees.

The Continuous Electron Beam Accelerator Facility (CEBAF) is being built in the eastern region of the state, supported by federal and state funds. For 1986-88, state appropriations for CEBAF total nearly $800,000. The facility will be a unique resource for graduate education and research. When it becomes fully operational, it will attract and support high-technology firms that will benefit from the state-of-the-art laboratories at the site.

The 1986 General Assembly appropriated $28.8 million in general funds to begin an equipment trust fund for higher education. The trust will issue bonds to make capital available to the state's public colleges and universities to purchase instructional equipment. The fund will enable the institutions of higher education to replace worn and obsolete equipment and to obtain state-of-the-art equipment, improving the education and skills of students entering the state's workforce.

The Virginia Community College System works with the Department of Economic Development, whose Industrial Employment Training Division provides employee education for business and industries moving to the state. Community college faculty specializing in occupational and technical education serve as instructors for these programs. The division received $4.5 million for the 1986-88 bienium.

The Virginia Institute of Marine Science is administered by a consortium of state-supported colleges and universities. The institute conducts research to assist businesses and industries that use the state's water resources. Funding for the institute totals $22.4 million in 1986-88.

The Center for World Trade was established by the 1986 General Assembly to provide training and analytical services tc the international business community and the Port of Hampton Roads. The legislature appropriated $300,000 in general funds to the center for 1986-88.

WASHINGTON

In 1982, Washington established a Committee on High Technology Training and Advancement. The committee was mandated to examine and evaluate state technical education, training and assistance programs, to identify barriers to high technology development and growth, and to recommend legislation, new

programs and other actions to promote high technology training and advancement. Based on the committee's recommendations, the legislature appropriated increased funding for expanded engineering programs and enacted two bills totalling $13.5 million for customized job training and high technology education and research.

One of the bills was the Washington High Technology Education and Training Act. The bill appropriated $10.6 million to support state colleges and universities in developing cooperative high technology programs. The programs include: (1) a new High Technology Center located at the University of Washington focusing on education and research in bioengineering, microelectronics, and materials science; (2) a state-wide telecommunications system that provides graduate and continuing education in engineering and management fields; (3) four new model technician training programs at state community colleges; (4) a $2.2 million program to improve computer literacy at the K-12 education level; (5) a 14-member (now 18) High Technology Coordinating Board to advise the state's education and training institutions and high technology programs; (6) and a new Southwest Washington Joint Center for Education located in Vancouver. The Center will offer undergraduate, graduate, and continuing education programs specially designed for the employees and potential employees of the area's growing industries.

The Washington Research Foundation was formed in 1981 as a privately funded, nonprofit corporation to assist in the patenting, licensing and transferring of technology from Washington state universities. The Foundation seeks to increase the rate of technology transfer by identifying and assessing possible innovations, assisting in patent licensing, providing financial and marketing advice, and securing entrepreneurial and venture capital support for commercialization. Royalties flow back through the foundation to the universities.

At the University of Washington in Seattle, five advanced technology companies have joined forces with university researchers to synthesize software for computer aided design of VLSI. Boeing Aerospace, John Fluke Manufacturing, Microtel Pacific Research, Honeywell and Tektronix are pooling resources with the university on the project, which is backed by $1.1 million in initial funding from the Department of Defense. The full-time corporate researchers work on campus using a VAX 11/780 computer.

WEST VIRGINIA

In 1983 with a $25,000 grant from the Appalachian Regional Commission, the West Virginia Board of Regents established the Center for Education and Research with Industry (CERI). In 1985, the CERI became headquartered at Marshall University. The Center promotes campus-business linkages through a statewide network and encourages the utilization of higher education's resources to further the state's economic development. Center programs

emphasize the direct provision of faculty expertise to specific problems, basic and applied research, and employee training. The budget for CERI is $100,000 plus grants for projects.

Also at Marshall University is the Center for Regional Progress, which links the resources of the university to economic and community development needs. The center was established in January 1984 with a $38,000 start-up grant from the employment and training division of the governor's office of economic and community development. The objective of the center is to assist organizations and individuals in the business, public, and private sectors. Faculty expertise is utilized in technical, scientific, and management areas. The center consists of six major divisions: business and industry, community and government, education, arts and culture, health, and family and consumer. The current budget is $150,000.

The West Virginia legislature has authorized matching funds for industry-sponsored research. The amount of state funds has not yet been determined.

The Center for Entrepreneurial Studies and Development was established at West Virginia University in Morgantown to assist small business entrepreneurs in the state. This center seeks to channel the expertise and talents of university faculty and students to assist small and/or developing business enterprises that lack the personnel, facilities or financial resources to conduct essential in-depth studies of business planning and operations.

In 1986, the state established the Higher Education Industry Partnership Program. This program provides for university-industry research and development centers, higher education-industry collaboration in technical assistance, and the Vandalia Partnership Fund which provides matching grants.

Also in 1986, an Institute for Public Affairs and a Center for Economic Research were established at West Virginia University and funded at $50,000 each. In addition, a Center for International Trade Development was created at Marshall University and funded in the amount of $50,000.

WISCONSIN

The University of Wisconsin is extensively engaged in five categories of techology advancement and economic development aimed at assisting business and industry. These categories include: product and process evaluation, the transfer of technology, legal, administrative and technical assistance, public/private partnerships, and the sponsoring of venture capital fairs.

The evaluation of products and processes are provided at a number of UW System centers. These centers help inventors assess the commercial market for their designs. Inventors bring their ideas and models to the center for evaluation and advice. Often

faculty and center staff visit Wisconsin companies to determine interest in new products. UW-Whitewater has a very successful program where a person for a $100 fee can receive a detailed evaluation of the commercial feasibility of his or her invention. UW-Stout, through its Center for Innovation and Development, conducts industry-sponsored research projects related to automation, integrated manufacturing, process improvement and quality assurance. The center also provides technical assistance to entrepreneurs and provides industry funded professorships allowing UW-Stout to establish closer ties with Wisconsin firms. These centers have evaluated and recommended action on hundreds of inventions, often with the direct assistance of the University of Wisconsin System engineering and business faculty.

In 1983, Wisconsin established a public/private partnership Technology Development Fund. In 1985, $1.8 million in grant money was awarded to business in support of research and development of new products and processes and to the University of Wisconsin System for technical information. Businesses are expected to contribute up to 90 percent of the cost of any research and development proposal that results in a commercial application. In the past two years, the Technology Development Fund has supported over 28 applicants in the fields of medical and manufacturing equipment, agricultural production, electronics, and genetic and chemical engineering.

The success of the program can be measured in several ways. First, the grants have generated more than $8 million in private sector investments in research. In addition, a considerable number of plant expansions and new business starts have resulted from the successful introduction of new products or processes.

Technology transfer programs are being expanded significantly within the UW System. Following are some representative types of programs offered:

The University of Wisconsin-Madison's University Industry Research Program (UIR) acts as a clearing house or "window" between industry and the important research program at the UW-Madison. UIR answers requests for assistance and data-based information; provides special and general seminars and assistance to faculty on patents and grants; and oversees at least 20 research consortia which carry university research to industry. In 1985, the UIR answered over 200 requests for assistance from industries ranging from biotechnology to separating salvageable metals from discarded auto seats. It also met more than 750 requests for faculty information.

At UW-Milwaukee, the Office of Industrial Research and Technology Transfer provides a formal link between UW-Milwaukee and Wisconsin industry to facilitate cooperative research and development programs. A number of major research consortia have been formed with Wisconsin corporations from this effort.

The UW-Madison College of Engineering and Department of Statistics established the Center for Productivity and Quality

Improvement and thus gained a head start in the task of redefining the basic concept of labor cost and improved productivity factors of modern business that has undergone significant changes in recent years.

The University of Wisconsin System recently established the Wisconsin Center of Manufacturing and Productivity. The Center will act as a network among the engineering deans to provide business and industry with access to the resources at their universities. Seven state institutions are participating in the Center program.

Business outreach services are provided through the UW Extension's eleven Small Business Development Centers and 72 county extension offices. In 1985 the SBDCs offered more than 800 programs that were attended by a total of 17,000 persons. In addition, more than 3,000 owners or managers of small businesses received individual counseling.

Extension's SBDC undertook a new initiative in 1984, by providing funds for the Wisconsin Technology Transfer Program. This program enables University of Wisconsin faculty to assist existing manufacturing companies in the development of new product lines.

Through University of Wisconsin System sponsored Wisconsin Venture Fairs, Wisconsin entrepreneurs have been put in touch with venture capitalists throughout the nation resulting in a number of successful agreements. The venture capital funding concept is catching on nationwide and Wisconsin is on the "circuit" of venture capitalists from throughout the United States and Canada. The fairs are organized to match Wisconsin businesses seeking financial assistance with financiers looking for profitable investments. The UW System acts as a facilitator in bringing the entrepreneur and the venture capitalist together.

Wisconsin also established in 1983 a Customized Labor Training Fund with first year funding at $900,000. This grant program is designed to meet the critical manpower needs of specific businesses when the training is not available through existing federal, state and local resources. The goal of the fund is to stimulate the expansion of existing business, the attraction and creation of new businesses, and the "retooling" of Wisconsin's industrial base by the introduction of new products and processes. Funds are awarded directly to businesses and a dollar for dollar match is required. The business is responsible for providing the training directly or through a contract with a training provider. Ten businesses have received funding in the primary areas of computer assisted design/manufacturing and quality testing specialties.

III. FUNDING OF PROGRAMS

The funding table that follows provides funding data, where available, on the total dollars and sources of funding of state programs that have been implemented to promote the development of high technology industry and foster economic growth within state borders.

The table attempts to indicate the total dollars and percent of state funds for all programs. However, in a number of cases, this information is not available since some programs are relatively new and are based on seed money from their state with the mandate of attracting funding in the future from other sources.

It should be noted that this table, while based on funding data from 1980 to the present, is not comprehensive due to a lack of available data in many states. Comparisons among states and/or programs are not valid because data may not be comparable. For example, data for some programs include capital expenditures while for other programs only operating expenditures are included.

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
ARIZONA						
Engineering Center of Excellence	$ 20.00	$ 10.00	$ 3.00		$ 33.00	60.60%
ARKANSAS						
Science & Technology Authority	$ .25				$ .25	100.00%
Inst. Funds for Economic Development	$ 3.40				$ 3.40	100.00%
CALIFORNIA						
MICRO	$ 3.40	$ 8.00			$ 11.40	29.82%
COLORADO						
Venture Capital Funds	$ 2.25	---------requires matching funds----------			$ 2.25 +	N/A
CONNECTICUT						
Fund for Excellence/Cooperative Research Grants/High Technology Project & Program Grants	$ 3.50	---------requires matching funds----------			$ 3.50 +	N/A
FLORIDA						
Enhancement of Engineering Schools	$ 54.00				$ 54.00	100.00%
GEORGIA						
Microelectronics Research Center	$ 15.00	----------	$15.00	----------	$ 30.00	50.00%
Biotechnology Center	$ 15.00				$ 15.00	100.00%
Upgrade Tech Education Programs	$ 13.80				$ 13.80	100.00%
HAWAII						
High Tech Development Corp	$ .10				$ .10	100.00%
ILLINOIS						
Illinois Venture Fund	$ 2.00				$ 2.00	100.00%
Tech. Innovation & Economic Growth	$ 10.50				$ 10.50	100.00%
Advanced Tech. Equipment Grants	$ 2.35				$ 2.35	100.00%
Economic Development Grants	$ 3.50				$ 3.50	100.00%
Engineering Equipment Grants	$ 1.00				$ 1.00	100.00%
Beckman Inst. - Univ. of Illinois	$ 10.00	----------involves matching funds----------			$ 10.00 +	N/A

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
Microelectronics Lab - Urbana	$ 13.70				$ 13.70	100.00%
Digital Computer Lab - Univ. of Illinois	$ 15.40				$ 15.40	100.00%
INDIANA						
Corp for Science & Technology	$ 20.00				$ 20.00	100.00%
Computer Integrated Design, Manuf. & Automation Center			$ 2.0		$ 2.00	.00%
IOWA						
Iowa High Technology Council	$ 3.00				$ 3.00	100.00%
Iowa Venture Capital Fund	$ .10		$ 15.0		$ 15.10	67.00%
Product Development Corporation	$ .75	requires additional investments			$ .75 +	N/A
KANSAS						
Research Matching Grant Program	$ .61	requires $ .915 in matching funds			$ 1.53	39.87%
Centers of Excellence Program	$ .50	requires $ .25 in matching funds			$ .75	66.67%
KENTUCKY						
Bluegrass State Skill Corporation	$ .86	$ 2.22			$ 3.08	38.74%
Robotics Center	$ 13.20				$ 13.20	100.00%
EPSCoR	$ .60		up to $3.0		$ 3.60	16.67%
LOUISIANA						
Louisiana Innovation Center	$ .10				$ .10	100.00%
MAINE						
Maine Capital Corporation	$ 1.00				$ 1.00	100.00%
MARYLAND						
Biotechnology Center	$ 3.80				$ 3.80	100.00%
Engineering Research Center	$ 1.80				$ 1.80	100.00%
Center for Advanced Computer Studies	$ 1.70				$ 1.70	100.00%
Engineering Systems Research Center	$ 7.00	$ 3.00	$ 16.00		$ 26.00	26.92%

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
Montgomery County High Tech Council				$ .30	$ .30	.00%
Teachers in Areas of Critical Shortage	$ .07				$ .07	100.00%
MASSACHUSETTS						
Massachusetts Tech Development Corp	$ 6.00	$ 50.00			$ 56.00	12.00%
Bay State Skills Center	$ 3.00	-requires 50% match-			$ 3.00 +	N/A
Microelectronics Center	$ 20.00	----------requires $ 20.0 match----------			$ 40.00	50.00%
MICHIGAN						
Michigan Venture Capital Fund	$ 42.00				$ 42.00	100.00%
Michigan's State Research Fund	$ 21.70	----------requires matching funds----------			$ 21.70 +	N/A
Industrial Technology Institute	$ 21.00	---req. matching $--			$ 21.00 +	N/A
Molecular Biology Institute	$ 6.00				$ 6.00	100.00%
Metropolitan Center for High Tech	$ 1.50				$ 1.50	100.00%
MISSOURI						
Research & Applied Research Projects	$ 1.43	---req. matching $--			$ 1.43 +	N/A
MONTANA						
Science & Tech Development Board	$ 2.00				$ 2.00	100.00%
NEW JERSEY						
Advanced Technology Centers	$ 57.00	-partic. fee req.---			$ 57.00 +	N/A
Technology Centers	$ 10.00				$ 10.00	100.00%
Competitive Grants	$ 35.00				$ 35.00	100.00%
Innovation Partnerships	$ 2.00	---req. matching $--			$ 2.00 +	N/A
Excellence Initiative	$ 6.20				$ 6.20	100.00%
Rutgers Challenge Grants	$ 8.70				$ 8.70	100.00%
NEW MEXICO						
New Mexico Business Development Corp.	$ 1.80	involves matching $			$ 1.80 +	N/A
New Mexico Energy R&D Institute	$ 6.00				$ 6.00	100.00%
Centers of Technical Excellence	$ 6.03				$ 6.03	100.00%

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
NEW YORK						
Productivity Development Program	$ .09	$ .15		$	.24	37.50%
Research & Dev. Grants Program	$ .20	involves matching funds		$	.20 +	N/A
Centers for Advanced Technology	$ 7.50	$ 9.00		$	16.50	45.50%
Small Business Innovation Research	$ .40	matches SBIR $		$	.40 +	N/A
Corp. for Innovation Development Program	$ .65		$ 3.0	$	3.65	17.80%
Business Venture Partnership	$ 60.00			$	60.00	100.00%
NORTH CAROLINA						
Microelectronics Center	$ 82.00	involves matching $		$	82.00 +	N/A
Enhancement of High Tech Educ. & Research	$ 50.00	involves matching $		$	50.00 +	N/A
Biotechnology Center	$ 2.70			$	2.70	100.00%
School of Science & Math	$ 4.60			$	4.60	100.00%
Incubator Facilities Program	$ .80		$.70	$	1.50	53.33%
Innovation Research Fund	$ .60			$	.60	100.00%
Computer Science Bldg. & Program Dev.-UNC	$ 9.21			$	9.21	100.00%
Equipment in Engineering & Science	$ 1.60			$	1.60	100.00%
OHIO						
Thomas Edison Program	$ 67.90	req. matching $		$	67.90 +	N/A
Eminent Scholars	$ 9.00	$ 9.00		$	18.00	50.00%
Research Challenge Program	$ 28.00	involves matching funds		$	28.00 +	N/A
Venture Capital - State Pension Funds	$ 60.00			$	60.00	100.00%
OREGON						
High Tech. Equipment & Research	$ 4.50			$	4.50	100.00%
High Tech Equipment & Research	$ 1.50	involves matching $		$	1.50 +	N/A
PENNSYLVANIA						
Ben Franklin Challenge Grant	$ 21.30	$ 53.80	$ 27.1	$	102.20	20.84%

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
Small Business Incubator Loan Program	$ 17.00				$ 17.00	100.00%
Seed Venture Capital Fund	$ 3.00	$ 9.00			$ 12.00	25.00%
Research Seed Grants	$ 1.20				$ 1.20	100.00%
Economic Revitalization Tax Credit Program	$ 25.00				$ 25.00	100.00%
Engineering School Equipment Grants	$ 3.00	$ 9.00			$ 12.00	25.00%
PENNTAP	$ .20				$ .20	100.00%
Investment of State Employees Retirement Fund	$ 51.00				$ 51.00	100.00%
PIDA	$ 12.50				$ 12.50	100.00%
Small Business Development Grants	$ .61				$ .61	100.00%
SOUTH CAROLINA						
Research & Development Grants	$ 10.00		$40.00		$ 50.00	20.00%
TENNESSEE						
Technology Corridor Foundation	$ 1.30 *		* Fed $ included		$ 1.30	N/A
Institutional Research	$ 19.00				$ 19.00	100.00%
TEXAS						
University Chairs		$ 32.0			$ 32.00	N/A
Competitive Research Grants	$ 35.00				$ 35.00	100.00%
MCC				$ 15.00	$ 15.00	.00%
INVENT	$ .48				$ .48	100.00%
UTAH						
Utah Technology Finance Corp.	$ 1.00		$ 4.0		$ 5.00	20.00%
Utah Science Council - Centers of Excellence	$ 2.50				$ 2.50	100.00%
VIRGINIA						
Center for Innovative Technology	$ 48.00				$ 48.00	100.00%
Cooperative Graduate Televised Engineering Program	$ 16.40				$ 16.40	100.00%
CEBAF	$ .80		Fed $		$ .80 *	N/A
Equipment Trust Fund	$ 28.80				$ 28.00	100.00%
Industrial Employment Training	$ 4.50				$ 4.50	100.00%
Institute of Marine Science	$ 22.40				$ 22.40	100.00%

SOURCE OF FUNDING OF STATE INITIATIVES TO PROMOTE HIGH TECHNOLOGY AND ECONOMIC GROWTH, 1980 to PRESENT

($ in Millions)

STATE/PROGRAM	STATE FUNDS	PRIV./INDUSTRY FUNDS	FEDERAL FUNDS	OTHER FUNDS	TOTAL FUNDS	% STATE FUNDS
Center for World Trade	$ .30			$	.30	100.00%
WASHINGTON						
Job Training/High Tech Educ & Res.	$ 13.50			$	13.50	100.00%
WEST VIRGINIA						
Center for Education & Research with Industry	$ .10			$	.10	100.00%
Center for Regional Progress	$ .15			$	.15	100.00%
WISCONSIN						
Technology Development Fund	$ 1.80	$ 8.00		$	9.80	18.37%
Customized Labor Training Fund	$ .90	---req. matching $--		$	.90 +	N/A

Note: This funding table does not include all the programs that are described in this report; this table includes programs for which funding data were available.

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IV. RECOMMENDATIONS FOR MARYLAND

On November 23, 1981, the Governor established the Ad Hoc Committee on High Technology to assess the high technology sector and propose effective measures to further establish and sustain high technology industry as a viable component of the State's economy. On July 20, 1983, the Committee became permanently established by the State as the High Technology Roundtable. The committee established an agenda to encourage the growth of high technology industry; recommendations included the following:

> "... the State must develop a pre-eminent engineering and business reputation at the university level. The State must encourage university-industry partnerships, and the State should invest in an engineering research center..."

Although Maryland has begun several programs to foster economic growth through high technology, much more should be done. An assessment of existing programs in other states indicates that with some incentives, business and industry will support research and development in a variety of high technology areas. California, Massachusetts, New York, Ohio, Pennsylvania, and Wisconsin have all instituted programs with substantial state dollars as seed money. Currently 50 to 90 percent of the funds in these programs are from nonstate sources.

Two major types of programs involving higher education/ business and industry partnerships that states have implemented are faculty research grants and centers of high technology. Maryland has begun the development of centers of high technology with the establishment of the Biotechnology Institute, the Engineering Research Center, and the Center for Advanced Computer Studies. With continued State support, these centers should attract investments from business and industry as the economic benefits of establishing closer ties to the research and development conducted at the centers becomes recognized.

In addition, the SBHE recommends the establishment of a partnership grant program, which would be available to all institutions in Maryland. Such a program would provide state funds based on competitive grants to faculty to conduct research in specified high tech areas where business and industry would agree to provide matching funds. The goal of this program is to promote joint university-industry research at Maryland colleges and universities that would support the development of high tech products and businesses in the State. State funding would be awarded to the best proposals as judged by a panel of experts. The SBHE will propose funds for this program for the FY 1988 Budget.

In addition, the State should provide $1.3 million to establish the Agriculture Biotechnology Center. This will provide the State with four Biotechnology Centers.

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